

Patent Claims

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1. Rapid prototyping apparatus for the manufacturing of three dimensional objects by additive treatment of cross sections comprising a wholly or partially light-sensitive material (2), said apparatus comprising at least one light source for illumination of a cross section of the light-sensitive material (2) by at least one spatial light modulator of individually controllable light modulators,
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- characterized by
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- at least one light source being optically coupled to a plurality of light guides (8) arranged with respect to the spatial light modulator arrangement in such a manner that each light guide (8) illuminates a sub-area of the cross section.
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2. Rapid prototyping apparatus of claim 1 characterized by each spatial modulator arrangement comprising transmissive light valves.
3. Rapid prototyping apparatus of claim 1 or 2 characterized by said apparatus comprising a first lens arrangement, said first lens arrangement comprising at least one micro lens arranged with respect to each light valve in such a manner that that the emitted light by the light emitter(s) (8) focuses on or in proximity of the optical axis of the individual light valves.
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4. Rapid prototyping apparatus of claims 1 to 3 characterized by said apparatus comprising a second lens arrangement, said second lens arrangement comprising at least one micro lens arranged between the light valves and the illumination surface in such a manner that light transmitted through the light channels of the individual light valves is suitably focused on the illumination surface.
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5. Rapid prototyping apparatus of claims 1 to 4 characterized by optical fibers, preferably multi mode fibers, constituting the optical light guides (8).
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6. Illumination device of claims 1 to 5 characterized by at least one of the light sources being made of a short arc gap lamp.
- 5 7. Rapid prototyping apparatus of claims 1 to 6 characterized by the individual light valves being arranged in rows in the transverse direction of the surface at a given mutual distance, said rows being mutually displaced in the transverse direction.
- 10 8. Rapid prototyping apparatus of claims 1 to 7 characterized by the rows being arranged in such a manner that the projection of each individual light valve in the transverse direction on the surface results in a number of illumination points at a given mutual distance in the transverse direction.
- 15 9. Rapid prototyping apparatus of claims 1 to 8 characterized by the surface profile(s) of the spatial modulator arrangements being arranged on one or more exposure heads, said exposure heads and said illumination surface being designed to make a relative movement, said rapid prototyping apparatus being provided with a control circuitry for control of the spatial light modulator arrangements in dependency of the movement between the exposure head and the illumination surface.
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10. Rapid prototype apparatus of claims 1 to 9 characterized by the exposure head(s) comprising a bar whose relative movement over the illumination surface consists of one single progressing movement in the transverse direction of the bar.
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11. Rapid prototyping apparatus of claims 1 to 10 characterized by the illumination device between the spatial light modulator arrangement and the illumination surface comprising optical means for the spreading of the light beams emitted by the light modulator arrangement over the illumination surface.
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12. Rapid prototyping apparatus according to claims 1 to 11 characterized by the modulator arrangement of the illumination device being spatial light modulators such as LCD, PDLC, PLZT, FELCD or Kerr cells.
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13. Rapid prototyping apparatus of claims 1 to 12 characterized by the modulator arrangement of the illumination device being reflective electromechanical light valves such as DMD.
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14. Rapid prototyping apparatus of claims 1 to 13 characterized by the light guides of the illumination device being arranged with respect to the modulator arrangement in such a manner that the furnished optical energy to each subset of light valves does not vary significantly once the subsets of light valves illuminate adjacent sub-areas in close proximity to each other on the illumination surface.
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15. Method of manufacturing three dimensional objects by means of a rapid prototyping apparatus where a wholly or partially light-sensitive material is treated by at least one light source illuminating a cross section of the material by at least two modulator arrangements of individually controllable light modulators,
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- characterized by
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- at least one light source being optically coupled with a plurality of light guides (8) arranged with respect to the spatial light modulator arrangement in such a manner that each light guide (8) illuminates a sub-area of the cross section.
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16. Method of claim 15 characterized by a wholly or partially light-sensitive material (2) being placed in a layer on a plate (24) in a container and subsequently exposed to an RP apparatus prior to creating a new layer on top of the previous layer.

17. ~~Method of claim 15 or 16 characterized by an RP apparatus being provided with a computer-aided design program wherein a 3D representation of the desired prototype is converted into files containing a cross section of the prototype and wherein the contents of the files are used to control the spatial light modulator arrangement.~~

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